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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/677,454	10/02/2003	Sion M. Pickard	7000Z	8506

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EXAMINER	
MAI, NGOCLAN THI	
ART UNIT	**PAPER NUMBER**
1742	

DATE MAILED: 01/31/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	**Application No.** 10/677,454	**Applicant(s)** PICKARD ET AL.
	Examiner Ngoclan T. Mai	**Art Unit** 1742

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *21 October 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-4,17,18,41-45,51-96,107-135 and 140-154* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *See Continuation Sheet* is/are rejected.

7)☒ Claim(s) *3,55-62,78-84,108,109,112,113,116,122,123,126,127,130 and 133* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

Continuation of Disposition of Claims: Claims rejected are 1,2,4,17,18,41-45,51-54,63-77,85-89,91-96,107,110,111,114,115,117,118,120,121,124,125,128,129,131,132,134,135 and 140-154.

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claim 2 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The phrase "comprised essentially of" in claim 2 is legally meaningless.

3. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claim Rejections - 35 USC § 103

4. Claims 1-2, 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ekstrom et al. (US Patent Application Publication 2004/0053039) in view of Miyamoto et al (6,673,439B1). Ekstrom et al discloses a composite structure comprising a metal matrix having diamond particles dispersed therein, the particles coated with a layer of SiC (paragraph 29-34), the composite structure having a thermal conductivity of greater than 300 W/mK (paragraph 22), wherein the matrix metal is copper (paragraph 44). The claim does not preclude the silicon from being in alloy form. It would have been obvious to one skilled in the art that the SiC layer in Ekstrom et al would be a beta-SiC layer because Miyamoto et al ('439) disclose (col. 2, lines 19-30) that the beta-SiC film has an enhanced strength and thus is unlikely to separate from diamond.

5. Claims 1-2, 4, 17-18, 41-45, 51-54, 63-67, 70-77, 85-89, 90, 93-96, 107, 110-111, 114, 121, 124-125, 128, 140-145, and 149-151 are rejected under 35 U.S.C. 103(a) as being unpatentable over Miyamoto et al (6,673,439) in view of Colella et al (5,783,316) and Ekstrom (U.S. Pat. Pub. 2004/0053039).

Miyamoto discloses a composite material comprising SiC coated diamond particles dispersed in aluminum matrix, wherein the SiC coating is formed by chemical reacting SiO gas with carbon supplied from the diamond to form β-SiC coating having thickness of 0.001 to 0.3 μm. See Example 3, col. 8, line 65 to col. 9, line 7, and col. 4, lines 41-46 and 56-65. Note the β-SiC coating reads on the claimed layer of β-SiC chemically bonded to the surface (diamond particle) thereof.

The applicant has established that the thermal conductivity of Miyamoto's composite is less than 300 W/mK through declaratory evidence. However, this thermal conductivity is based on the use of aluminum as the metal matrix. U.S. Patent 5,783,316 to Colella shows that it is known in the art to form similar diamond-metal composites using copper or silver as the metal matrix (col. 8, lines 5-10). It is known that silver has a thermal conductivity of 430 W/mK and copper a conductivity of 400 W/mK, as compared to 220 W/mK for aluminum. Ekstrom et al ([002]) show these facts. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to replace the aluminum of Miyamoto with the copper or silver of Colella with the expectation that such a replacement would increase the thermal conductivity of the resulting composite. It would be reasonable to conclude that the resulting product would have much higher thermal conductivity such as about 300 W/mK as claimed since the thermal conductivity of copper or silver is twice as high as that of aluminum in view of Ekstrom et al.

Regarding claims 18, 70-73 and 93-96: Miyamoto teaches employing diamond powder having mean particle diameter desirably 0.5 to 1500 microns, see col. 5, line 63 to col. 6, line 8.

Regarding claims 41-45, 74-77 and 90, 93-96: while the surface coating of the diamond in the composite taught by Miyamoto is not formed by heating a preform of Si powder and diamond powder plus binder, the composite taught contains the all of the claimed materials, thus anticipates the claimed composite. Note that it has been established that a product by process claim is directed to the product per se, no matter how actually made, *In re Kirao*, 190 USPQ 15 at 17 (footnote 3). See also *In re Thorpe*, 227 USPQ 964 (CAFC 1985), which makes it clear that it is the patentability of the final product per se which must be determined in a product by process claim and not the patentability of the process.

An old or obvious product produced by a new method is not patentable as a product, whether claimed in a product by process claims or not. The applicant has the burden of proof in such case.

Regarding the thermal conductivity limitations in claims 51-54 and 74-77, it appears the claimed property is material property. Consequently, the properties as recited in the instant claims would have inherently possessed by the teachings of the cited references. Therefore, the burden is on the applicant to prove that the product of the prior art does not necessarily or inherently possess characteristics attributed to the claimed product. In re Spade, 911 F.2d 705, 708, 15 USPQ2d 1655, 1658 (Fed. Cir. 1990), In re Best, 195 USPQ 430 and MPEP § 2112.01.

Regarding claims 67 and 90: Miyamoto teaches employing 40 vol. % SiC coated diamond particle for the composite material. See example 3.

With respect to the intended "for LDMOS electronic packages" claimed in claims 107, 111, 121, 124-125 that the claimed intended use of the claimed composite material does not lend patentability to the composite material. A mere statement of a new use for an otherwise old or obvious composition cannot render a claim to the composition patentable. See In re Lemin, 51 CCPA 942, 326 F.2d 437, 140 USPQ 273 (1964), In re Thuau 135 F.2d 344, 57 USPQ 324 (CCPA 1943), Ex parte Douros 163 USPQ 667 (POBA), and In re Craige, 188 F.2d 505, 89 USPQ 393 (CCPA 1951). Furthermore, the claimed properties are mere material properties which would have been inherently possessed by the materials of cited references. See In re Best, 195 USPQ 430 and MPEP § 2112.01.

6. Claims 68-69 and 91-92 are rejected under 35 U.S.C. 103(a) as being unpatentable over Miyamoto et al (6,673,439) in view of Colella et al (5,783,316) and Ekstrom (U.S. Pat. Pub. 2004/0053039) in view of McCoy et al.

Miyamoto et al, Colella et al and Ekstrom disclose a composite material for use as a heat sink in electronic industry substantially as claimed.

The difference between the claims and the references is that the references do not specifically teach employing the claimed amount of SiC coated diamond powder in the composite.

However it is known in the electronic packaging art that a substrate for use as heat sink must have unique combination of high thermal conductivity, low thermal expansion, as well as an electrical connection to the electronic device. See McCoy, abstract. McCoy teaches that such unique combination of properties is depended on the loading fraction of the diamonds (the volume ratio of metal matrix to diamond), see col. 3, lines 14-22. McCoy also teaches that diamond has extremely high heat conductivity and low thermal expansion, see col. 4, lines 2-9. Although the claimed amount of SiC coated diamond in the composite is not taught by neither references, such would not be a patentable difference since it would be an obvious modification to increase the amount of SiC coated diamond in the composite in the composite substrate taught by Miyamoto, Colella et al and Ekstrom in view of McCoy if higher thermal conductivity and lower thermal expansion for the substrate is desired. Hence the difference would appears to no more than routine optimization of the amount SiC coated diamond used, which is well within the skill of the artisan and productive of no new and unexpected results.

7. Claims 115, 117-120, 129, 131-132, 133, and 134, 146-148, and 152-154 are rejected under 35 U.S.C. 103(a) as being unpatentable over McCoy (US patent 6,727,117 B1) in view of Miyamoto et al (6,673,439), Colella et al (5,783,316) and Ekstrom (U.S. Pat. Pub. 2004/0053039).

McCoy teaches a semiconductor package of the LDMOS type having a metallic substrate with a die comprising semiconductor device, i.e., chip, mounted directly thereon. The metallic substrate is formed of a highly thermal conductive material such as SiC coated diamond particles in a metal matrix, see McCoy, col. 2, line 58 to col. 3, line 26 and col. 4, lines 29-51. McCoy teaches that the substrate functions to remove heat from the semiconductor package. See col. 3, lines 6-13.

The difference between the claims and McCoy is that McCoy does not specifically teach employing substrate formed of SiC coated diamond particles in aluminum matrix.

Miyamoto et al in view of Colella et al and Ekstrom teach a composite material formed of SiC coated diamond particles in copper matrix having high thermal conductivity and for use as a heat sink material in electronic industry.

Since the claimed composite substrate is conventionally known for use as heat sink in electronic industry as taught by Miyamoto et al in view of Colella et al and Ekstrom, it would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute the composite substrate taught McCoy with the known composite taught by Miyamoto et al in view of Colella et al and Ekstrom for the same purpose.

8. Claim 135 is rejected under 35 U.S.C. 103(a) as being unpatentable over Anschel et al. (US 4,914,551) in view of Miyamoto et al in view of Colella et al and Ekstrom.

Anschel teaches an electronic package employing a heat spreader **37** interposed between the package's semiconductor device **17** (e.g., silicon chip) and heat sink components **33** for providing an enhance heat path from the semiconductor device to the heat sink. See col. 1, lines 32-39 and 54-65. The heat spreader **37** taught can be silicon carbide, aluminum nitride or metallic material, see col. 3, lines 46-49. The difference between Anschel is that Anschel does not teach employing heat sink formed of the claimed composite material.

Miyamoto et al in view of Colella et al and Ekstrom teach the claimed composite material having high thermal conductivity that can be used for electronic material such as heat sink material. See col. 9, lines 13-16.

It would have been obvious to one of ordinary skilled in the art at the time the invention was made to employ the composite material taught by Miyamoto as a heat sink in the electronic package taught by Anschel since employing such highly thermal conductive composite material would further enhance the removing of heat from the semiconductor device.

9. Claims 3,55-62,78-84,108,109,112,113,116,122,123,126,127,130 and 133 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ngoclan T. Mai whose telephone number is (571) 272-1246. The examiner can normally be reached on 9:30-6:00 PM Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy King can be reached on (571) 272-1244. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Ngoclan Ma
Ngoclan T. Mai
Primary Examiner
Art Unit 1742

n.m.